February 26, 2001

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Mr. John K. Wood
Vice President - Nuclear, Perry
FirstEnergy Nuclear Operating Company
P.O. Box 97, A200
Perry, OH 44081

SUBJECT: PERRY NUCLEAR POWER PLANT, UNIT 1 - ISSUANCE OF AMENDMENT RE: ACTIVATION OF THERMAL-HYDRAULIC STABILITY MONITORING INSTRUMENTATION (TAC NO. MA8671)

Dear Mr. Wood:

The U.S. Nuclear Regulatory Commission has issued the enclosed Amendment No.118 to Facility Operating License No. NPF-58 for the Perry Nuclear Power Plant, Unit 1. This amendment revises the Technical Specifications (TSs) in response to your application dated April 5, 2000 (PY-CEI/NRR-2474L), as supplemented by submittal dated January 15, 2001 (PY-CEI/NRR-2538L).

This amendment implements TS changes associated with thermo-hydraulic stability monitoring. New TS 3.3.1.3, "Oscillation Power Range Monitor (OPRM) Instrumentation," is added, providing the minimum operability requirements for the OPRM channels, the Required Actions when they become inoperable, and appropriate surveillance requirements. The amendment also removes monitoring guidance from TS 3.4.1, "Recirculation Loops Operating," that will no longer be necessary due to the activation of the OPRM instrumentation, and updates Specification 5.6.5, "Core Operating Limits Report (COLR)," to require the applicable setpoints for the OPRMs to be included in the COLR.

A copy of the Safety Evaluation is also enclosed. The Notice of Issuance will be included in the Commission's next biweekly Federal Register notice.

Sincerely,
/RA/
Douglas V. Pickett, Sr. Project Manager, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-440

Enclosures: 1. Amendment No. 118 to License No. NPF-58
2. Safety Evaluation

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NAME	DPickett		THarris		RCaruso*		EMarinos**	
DATE	2/8/01		2/8/01		01/18/01		01/23/01	

OFFICE	SC:IOLB		OGC w/c with comments		SC:PD3-2			
NAME	DTrimble**		RWeisman		AMendiola			
DATE	01/12/01		Feb 15 /01		02/23/01			

*See 1/18/01 memo to DPickett
**See memos to AMendiola

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NRR-058

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 26, 2001

Mr. John K. Wood
Vice President - Nuclear, Perry
FirstEnergy Nuclear Operating Company
P.O. Box 97, A200
Perry, OH 44081

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Docket No. 50-440

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cc w/encls: See next page

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

FIRSTENERGY NUCLEAR OPERATING COMPANY

DOCKET NO. 50-440

PERRY NUCLEAR POWER PLANT, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 118
License No. NPF-58

1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by the FirstEnergy Nuclear Operating Company (the licensee) dated April 5, 2000, as supplemented by submittal dated January 15, 2001, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

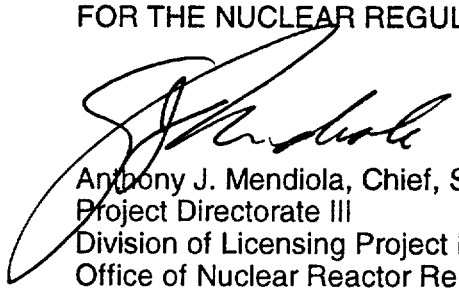
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. NPF-58 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A and the Environmental Protection Plan contained in Appendix B, as revised through Amendment No. 118 are hereby incorporated into this license. The FirstEnergy Nuclear Operating Company shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of its date of issuance and shall be implemented not later than 90 days after issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Anthony J. Mendiola, Chief, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical Specifications

Date of Issuance: February 26, 2001

ATTACHMENT TO LICENSE AMENDMENT NO. 118

FACILITY OPERATING LICENSE NO. NPF-58

DOCKET NO. 50-440

Replace the following pages of the Appendix "A" Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove	Insert
-----	3.3-14a
-----	3.3-14b
3.4-1	3.4-1
3.4-2	3.4-2
3.4-4	3.4-4
5.0-17	5.0-17
5.0-18	5.0-18

3.3 INSTRUMENTATION

3.3.1.3 Oscillation Power Range Monitor (OPRM) Instrumentation

LCO 3.3.1.3 Four channels of the OPRM Period Based Algorithm instrumentation shall be OPERABLE.

APPLICABILITY: THERMAL POWER $\geq$ 23.8% RTP

ACTIONS

---NOTE---
Separate Condition entry is allowed for each channel.

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One or more required channels inoperable.	A.1	Place channel in trip.	30 days
	OR		
	A.2	Place associated RPS trip system in trip.	30 days
	OR		
	A.3	Initiate alternate method to detect and suppress thermal hydraulic instability oscillations.	30 days
B. OPRM trip capability not maintained.	B.1	Initiate alternate method to detect and suppress thermal hydraulic instability oscillations.	12 hours
C. Required Action and associated Completion Time not met.	C.1	Reduce THERMAL POWER to < 23.8% RTP.	4 hours

SURVEILLANCE REQUIREMENTS

----------NOTE----------
When a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours, provided the OPRM maintains trip capability.

	SURVEILLANCE	FREQUENCY
SR 3.3.1.3.1	Perform CHANNEL FUNCTIONAL TEST.	184 days
SR 3.3.1.3.2	Calibrate the local power range monitors.	1000 MWD/T average core exposure
SR 3.3.1.3.3	----------NOTE---------- Neutron detectors are excluded. --- Perform CHANNEL CALIBRATION.	24 months
SR 3.3.1.3.4	Perform LOGIC SYSTEM FUNCTIONAL TEST.	24 months
SR 3.3.1.3.5	Verify OPRM is not bypassed when THERMAL POWER is > 28.6% RTP and recirculation drive flow is < the value corresponding to 60% of rated core flow.	24 months
SR 3.3.1.3.6	----------NOTE---------- Neutron detectors are excluded. --- Verify the RPS RESPONSE TIME is within limits.	24 months on a STAGGERED TEST BASIS

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.1 Recirculation Loops Operating

LCO 3.4.1 Either:

a. Two recirculation loops shall be in operation with matched flows;

OR

b. One recirculation loop shall be in operation with:

1. Thermal power ≤ 2500 MWt;

2. LCO 3.2.1 "AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR)" limits modified for single recirculation loop operation as specified in the COLR;

3. LCO 3.2.2 "Minimum Critical Power Ratio (MCPR)" limits modified for single recirculation loop operation as specified in the COLR; and

4. LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation," Function 2.b (Average Power Range Monitors Flow Biased Simulated Thermal Power-High) Allowable Value of Table 3.3.1.1-1 reset for single loop operation.

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Recirculation loop jet pump flow mismatch not within limits.	A.1 Declare the recirculation loop with lower flow to be "not in operation."	2 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Thermal power > 2500 MWt during single recirculation loop operation.	B.1 Reduce thermal power to ≤ 2500 MWt.	1 hour
C. Requirements b.2, b.3 or b.4 of the LCO not met.	C.1 Satisfy the requirements of the LCO.	24 hours
D. Required Action and associated completion time of Condition A, B, or C not met. OR No recirculation loops in operation.	D.1 Be in MODE 3.	12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.1.1	----------NOTE---------- Not required to be performed until 24 hours after both recirculation loops are in operation. ---------- Verify recirculation loop jet pump flow mismatch with both recirculation loops in operation is: a. ≤ 10% of rated core flow when operating at < 70% of rated core flow; and b. ≤ 5% of rated core flow when operating at ≥ 70% of rated core flow.	24 hours

5.6 Reporting Requirements

5.6.2 Annual Radiological Environmental Operating Report (continued)

results of these analyses and measurements in the format of the table in the Radiological Assessment Branch Technical Position, Revision 1, November 1979. In the event that some individual results are not available for inclusion with the report, the report shall be submitted noting and explaining the reasons for the missing results. The missing data shall be submitted in a supplementary report as soon as possible.

5.6.3 Radioactive Effluent Release Report

The Radioactive Effluent Release Report covering the operation of the unit during the previous year shall be submitted by May 1 of each year. The report shall include a summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the unit. The material provided shall be consistent with the objectives outlined in the ODCM and process control program and in conformance with 10 CFR 50.36a and 10 CFR 50, Appendix I, Section IV.B.1.

5.6.4 Monthly Operating Reports

Routine reports of operating statistics and shutdown experience, including documentation of all challenges to the main steam safety/relief valves, shall be submitted on a monthly basis no later than the 15th of each month following the calendar month covered by the report.

5.6.5 Core Operating Limits Report (COLR)

a. Core operating limits shall be established prior to each reload cycle, or prior to any remaining portion of a reload cycle, and shall be documented in the COLR for the following:

1. LCO 3.2.1, Average Planar Linear Heat Generation Rate (APLHGR),

2. LCO 3.2.2, Minimum Critical Power Ratio (MCPR),

3. LCO 3.2.3, Linear Heat Generation Rate (LHGR),

(continued)

5.6 Reporting Requirements

5.6.5 Core Operating Limits Report (COLR) (continued)

4. LCO 3.3.1.1, RPS Instrumentation (SR 3.3.1.1.14), and

5. LCO 3.3.1.3, Oscillation Power Range Monitor (OPRM) Instrumentation.

b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC in 1). NEDE-24011-P-A, General Electric Standard Application for Reactor Fuel or 2). NEDO-32465 "Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology for Reload Applications". (The approved revision at the time reload analyses are performed shall be identified in the COLR.)

c. The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal mechanical limits, core thermal hydraulic limits, Emergency Core Cooling Systems (ECCS) limits, nuclear limits such as SDM, transient analysis limits, and accident analysis limits) of the safety analysis are met.

d. The COLR, including any midcycle revisions or supplements, shall be provided upon issuance for each reload cycle to the NRC.

5.6.6 Special Reports

Special Reports shall be submitted in accordance with 10 CFR 50.4 within the time period specified for each report.

The following Special Reports shall be submitted:

a. Violations of the requirements of the fire protection program described in the USAR which would have adversely affected the ability to achieve and maintain safe shutdown in the event of a fire shall be reported via the Licensee Event Report system.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 118 TO FACILITY OPERATING LICENSE NO. NPF-58

FIRSTENERGY NUCLEAR OPERATING COMPANY

PERRY NUCLEAR POWER PLANT, UNIT 1

DOCKET NO. 50-440

1.0 INTRODUCTION

By letter dated April 5, 2000, and as supplemented by letter dated January 15, 2001, FirstEnergy Nuclear Operating Company (the licensee) proposed changes to the Technical Specifications (TS) to support the Oscillation Power Range Monitor as the long-term stability solution for the Perry Nuclear Power Plant (PNPP). The requested TS changes include:

(1) Introducing new TS 3.3.1.3, "Oscillation Power Range Monitoring (OPRM) Instrumentation," to provide requirements for the new OPRM instrumentation as the long-term stability solution for PNPP;

(2) Removing the manual monitoring guidance from TS 3.4.1, "Recirculation Loops Operable"; and

(3) Updating TS 5.6.5, "Core Operating Limits Report (COLR)," for the applicable setpoints methodology for the OPRMs.

The OPRM instrumentation for PNPP was installed, but not activated, in refueling outage 7 (RF07) during the spring of 1999. The scram signals from this instrumentation are currently planned to be activated during the next refueling outage (i.e., refueling outage 8 or RFO8). The OPRMs will provide automatic "detect and suppress" action to replace the administrative controls currently in effect through operator training and manual actions.

The staff performed an on-site review on the testing data to support the operability of the proposed new ABB/CE OPRM instrumentation on November 29, 2000, and the details of the results of the review are provided in this evaluation.

The supplemental information contained clarifying information and did not change the initial no significant hazards consideration determination and did not expand the scope of the original Federal Register notice.

2.0 BACKGROUND

Through Generic Letters 86-02, "Technical Resolution of Generic Issue B-19 - Thermal Hydraulic Stability," Generic Letter 94-02, "Long-term Solutions and Upgrade of Interim Operating Recommendations for Thermal-Hydraulic Instabilities in Boiling Water Reactors," and

Bulletin 88-07, "Power Oscillations in Boiling Water Reactors (BWRs)," the Nuclear Regulatory Commission (NRC) requested boiling-water reactor (BWR) facilities to take appropriate measures to prevent thermal-hydraulic instabilities.

In response to the NRC's concerns, General Electric (GE) Nuclear Energy issued the following licensing topical reports:

a. NEDO-31960, "BWR Owners' Group Long-Term Stability Solutions Licensing Methodology," and NEDO-31960, Supplement 1, "BWR Owners' Group Long-Term Stability Solutions Licensing Methodology (Supplement 1)," were approved by the NRC in November 1995.

b. NEDO-32465, "Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology for Reload Applications," was approved by the NRC in August 1996.

ABB Combustion Engineering's topical report CENPD-400-P, Rev. 1, "Generic Topical Report for the ABB Option III Oscillation Power Range Monitor," was approved by the NRC in 1995 and specifically addresses BWR plants with the ABB Option III OPRM.

By letters dated September 9, 1994, and December 14, 1998, the licensee asked for the NRC's approval for installation of the OPRM instrumentation to eliminate thermal-hydraulic instabilities at PNPP. The ABB Option III OPRM instrumentation was installed at PNPP during the seventh refueling outage and is undergoing testing with the plant operating under Interim Corrective Actions (ICAs). Currently, the OPRM instrumentation is not connected to activate a reactor scram. The proposed TS changes would enable the OPRM to automatically activate a reactor scram on detection of excessive stability related oscillations and would end the current ten-year old ICAs.

3.0 EVALUATION

3.1 New Technical Specification 3.3.1.3, OPRM

The licensee has proposed to add a new TS for the OPRM instrumentation, which includes the Limiting Condition for Operation (LCO), Applicability, Actions, and Surveillance Requirements necessary to define operability of the OPRM channels, and the actions the plant operators must take when the instruments become inoperable.

The licensee provided the justification for proposing this new TS following the example provided in the approved Topical Report CENPD-400-P-A, Appendix A. In the staff's safety evaluation accepting CENPD-400-P-A, the staff stated that any licensee referencing the topical report must identify and justify any deviations from CENPD-400-P-A and the associated safety evaluation. In addition, the staff requested plant specific information in six specific areas. The following discussion enumerates these six areas of staff interest.

1. *Confirm the applicability of CENPD-400-P, including clarifications and reconciled differences between the specific plant design and the topical report design descriptions.*

Licensee's Response: The licensee has reviewed the specific plant design against the generic topical report CENPD-400-P-A and confirmed that the document describes the plant specific design for the items appearing within CENPD-400-P-A with only minor exceptions. Exceptions included the omission of the "Manual Enable" function, the "Trouble" annunciator output of the

OPRM, and the plant computer interface. The licensee further stated that the OPRM circuit cards are coated to prevent damage from electrostatic discharge (ESD), have been tested for ESD, and are suitable for 10 percent relative humidity (RH) which bounds the 20 percent PNPP equipment qualification range and the 40 percent permissible RH value for the generic OPRM.

Staff Evaluation: The staff concluded that these exceptions will not adversely impact the safety-related functions of the OPRM and that the proposed OPRM system meets the NRC's conditions for compliance to CENPD-400-P-A.

2. *Confirm the applicability of Boiling Water Reactor Owners Group (BWROG) topical reports that address the OPRM and associated instability functions, setpoints and margins.*

Licensee's Response: The licensee confirmed that NEDO-32465-A and NEDO-31960-A are applicable to PNPP.

In the safety evaluation report (SER) approving NEDO-31960-A, the NRC specified that six additional areas be addressed. The areas of staff concern along with the licensee's response follows:

(I) *All three algorithms described in NEDO-31960 and Supplement 1 should be used in Option III or III-A. These three algorithms are the high local power range monitor (LPRM) oscillation amplitude, the high-low detection algorithm, and the period-based algorithm.*

Licensee's Response: The licensee confirmed that all three algorithms are included in the Option III design and that automatic protection is actuated if any of the three algorithms meet their trip conditions. Only the period-based algorithm is used to demonstrate protection of the maximum critical power ratio (MCPR) safety limit for anticipated reactor instabilities. The other two algorithms are included as defense-in-depth features. Only the period-based algorithm is required for Technical Specification operability of the OPRM instrumentation.

Staff Evaluation: This statement is in conformance with the staff position stated on pages 30 and 31 of the staff's SE dated August 16, 1995, approving CENPD-400-P-A and the staff concludes that the licensee's response complies with the NRC's condition for approving that report as stated above.

(II) *The validity of the scram setpoints selected should be demonstrated by analysis. These analyses may be performed for a generic representative plant when applicable, but should include an uncertainty treatment that accounts for the number of failed sensors permitted by the Technical Specifications of the plant's applicant.*

Licensee's Response: The licensee stated that the methodology as described in NEDO-32465-A was followed for the period-based algorithm. The analysis consisted of three parts: (1) the generic analysis contained within NEDO-32465-A, which produced the delta critical power ratio over initial MCPR versus oscillation magnitude (DIVOM) curves; (2) the plant-specific analysis, which produced the Hot Bundle Oscillation Magnitude for PNPP; and (3) the cycle specific analysis, which developed the cycle specific OPRM setpoint versus operating limit MCPR relationship.

Staff Evaluation: During the on-site review, the staff verified that the procedures are consistent with approved methodology and, therefore, acceptable (see Section 3.4 of this evaluation).

(III) *Implementation of Option III or III-A will require that the selected bypass region outside of which the detect and suppress action is deactivated be defined in the Technical Specifications.*

Licensee's Response: The licensee confirmed that this region is included in Surveillance Requirement 3.3.1.3.5. The exclusion region methodology (safety analyses contained in NEDO-31960) would define a curved region on the power to flow operating map cutting across the corner of the map near the intersection of the natural circulation line and the highest flow control line.

Staff Evaluation: The staff has reviewed the licensee's response and found it acceptable because the proposed exclusion region in conjunction with SR 3.3.1.3.5 is consistent with the boundaries discussed in NEDO-32465-A, Section 2.2.

(IV) *If the algorithms detect oscillations, an automatic protective action should be initiated. This action may be a full scram or a select rod insert (SRI). If an SRI is implemented with Option III or III-A, backup full scram must take effect if the oscillations do not disappear in a reasonable period of time or if they reappear before control rod positions and operating conditions have been adjusted in accordance with appropriate procedural requirements to permit reset of the SRI protective action.*

Licensee's Response: The licensee confirmed that the automatic protective action of the OPRMs at PNPP will be a full reactor scram, rather than an SRI.

Staff Evaluation: The staff has reviewed the licensee's response and found it acceptable because the proposed full reactor scram feature is in compliance with General Design Criteria (GDC) 10 and 12.

(V) *The LPRM groupings defined in NEDO-31960 to provide input to the Option III or III-A algorithms are acceptable for the intended oscillation detection function. These LPRM groupings are the OPRM for Option III or the octant-based arrangements for Option III-A. The requirements for a minimum OPERABLE number of LPRM detectors set forth in NEDO-31960 are acceptable.*

Licensee's Response: The licensee explained that the "four LPRMs per OPRM Cell - 4BL (Blockstanz-Lehmann Design)" configuration is used at PNPP.

Staff Evaluation: The staff reviewed the licensee's description and found it acceptable because this configuration is one of the example LPRM assignments given in the approved topical reports NEDO-32465-A and NEDO-31960-A.

(VI) *Page 10 of the NRC SE states that "the recirculation drive flow channel should comply with the requirement of IEEE-279...." The SE also says that the plant-specific submittal should include the specification documentation for the isolation devices.*

Licensee's Response: The PNPP recirculation drive flow subsystem for APRMs is designed and installed to Class 1E standards and resides in the Neutron Monitoring System cabinets. No

isolation is required between the recirculation drive flow and APRM circuitry. Therefore, this item is not applicable at PNPP.

Staff Evaluation: The staff finds the licensee's proposed OPRM system complies with the above-mentioned NRC condition for approval of the topical report.

3. *Provide a plant-specific TS for the OPRM functions consistent with CENPD-400-P, Appendix A.*

Licensee's Response: License Amendment No. 112, issued on June 1, 2000, authorized a 5 percent power uprate. In the SE, the staff noted that the licensee was planning to implement Option III and included the following discussion:

> *Perry is implementing long-term stability Option III. Under this option, OPRM signals are monitored to determine when a reactor scram is needed to disrupt an oscillation. When Option III is implemented, the power-to-flow operating map will be defined in plant procedures to include an armed region that is used in Option III. The armed region will be modified for uprated power conditions to maintain the current absolute power and flow coordinates. The licensee indicates that its stability-based MCPR calculations show no significant changes from current conditions.*

In order to provide consistency with the recently implemented 5 percent power uprate, the rated thermal power (RTP) values listed in the Applicability and Surveillance Requirements (SRs) of new TS 3.3.1.3, "Oscillation Power Range Monitor (OPRM) Instrumentation," will be modified in order to maintain the pre-uprate thermal power levels. The changes from CENPD-400-P-A, Rev 1, Appendix A, being proposed for TS 3.3.1.3 include:

- The Applicability and Required Action C.1 are revised from 25 percent to 23.8 percent RTP.

- The power level component of the Enable (Armed) Region in SR 3.3.1.3.5 is revised from 30 percent to 28.6 percent RTP.

The rated flow value of 60 percent in SR 3.3.1.3.5 does not change because rated core flow did not change as a result of the power uprate.

The licensee's proposed TSs are consistent with the generic specification provided in Appendix A of CENPD-400-P-A, Rev. 1, with the following two exceptions and the exceptions mentioned earlier (i.e., the omission of the "Manual Enable" function, the "Trouble" annunciator output of the OPRM, and the plant computer interface as described in item 1. above):

1. In SR 3.3.1.3.5, the licensee proposes RTP as "> 28.6 percent" while CENPD specified "$\geq$ 30 percent." Aside from the modification to reflect pre-uprate thermal power limits as described above, the licensee stated the proposed change (i.e., ">" as opposed to "$\geq$") more accurately describes the PNPP specific-enabled region and is consistent with the analyses in NEDO-32465.

2. CENPD-400-P-A includes an Action B.2 in LCO 3.3.1.3 that specifies restoration of OPRM trip capability within 120 days. In a recent event, the licensee experienced more than 10 months delay in solving an OPRM software problem reported in a 10 CFR Part 21 report filed by the ABB on June 29, 1999. When the OPRM trip capability is not

available, the plant will operate using the ICAs similar to the way the plant has operated for the last ten years. According to the requirements of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," when operating within the ICAs, the licensee will be required to promptly identify and correct any problems.

Staff Response: The staff reviewed the licensee's proposed TS 3.3.1.3 and concludes that it is generally consistent with CENPD-400-P-A, Appendix A. The modification to reflect RTP to pre-uprate thermal power limits is consistent with the staff's understanding as discussed in the SE approving the power uprate.

Regarding the first exception, the staff finds there is very little difference between the two parameters and the proposed TS change is acceptable. Considering the licensee's plant-specific experience with the OPRM software related problem, the staff finds this TS change acceptable.

4. *Confirm that the plant-specific environmental (temperature, humidity, radiation, electromagnetic and seismic) conditions are enveloped by the OPRM equipment qualification values.*

Licensee's Response: The licensee stated that the OPRM components are qualified in accordance with IEEE 323-1974, which is in PNPP's licensing basis.

Furthermore, the licensee provided the following information on equipment qualification addressed in Section 4.0 of CENPD-400-P-A:

Temperature/Heating Loading: The licensee stated that addition of the OPRM instrumentation does not increase the overall heat load in the control room. This is because two existing power supplies have been replaced by more efficient power supplies thereby compensating for the heat produced by the OPRM instrumentation.

Humidity: The licensee stated that the OPRM circuit cards are coated to prevent damage from electrostatic discharge (ESD), have been tested for ESD, and are suitable for 10 percent RH which bounds the 20 percent RH PNPP equipment qualification range and the low end of the generic OPRM qualified range of 40 percent RH.

Radiation: The licensee stated that the plant-specific total integrated dose condition at the OPRM location is 180 RAD which is well within the OPRM designed parameter of 10,000 RAD.

Electromagnetic Interference (EMI): The licensee stated that the OPRM was EMI tested to Electric Power Research Institute (EPRI) document TR 102323, "Guidelines for Electromagnetic (EMI) Testing in Power Plants." Further, the OPRM modules were tested to Mil Std-461C and 462 for radiated and conducted susceptibility. They are designed and tested to meet the electrostatic discharge and surge withstand capability of IEC 801-2 and IEC 801-4, respectably.

Seismic: The OPRM hardware is seismically tested to IEEE 344-1987 and a design review demonstrated that the existing safety-related devices were not affected by the addition of the OPRM.

Staff Evaluation: The staff finds the above statements are in conformance with CENPD-400-P-A and are, therefore, acceptable.

5. *Confirm that administrative controls are provided for manually bypassing OPRM channels or protective functions, and for controlling access to the OPRM functions.*

Licensee's Response: The licensee provided a detailed discussion on the OPRM bypassing system and the administrative control. Each independent OPRM is controlled by a local key locked switch with a common BYPASS annunciator in the control room. The licensee confirmed that the bypass and function keylock switches are under operational control and are administratively controlled per Operations Administrative Procedures, which comply with the Updated Safety Analysis Report (USAR), Section 7.2.2.a.14.

Staff Evaluation: The staff finds that the licensee's administrative controls appropriately provide for manual bypass of OPRM channels, and appropriately control access to OPRM functions.

6. *Confirm that any change to the plant operator's main control panel have received human factors reviews per plant-specific procedures.*

Licensee's Response: This modification was reviewed by the PNPP Human Factors Group to ensure human factors considerations were part of the design. The modification was found not to violate human factors commitments as described in the USAR, and incorporates adequate human factors principles consistent with PNPP Human Factors Standards for annunciators and controls.

Staff Evaluation: The changes to the control room consist of the addition of eight new annunciators, also available at the local OPRM panels. Four are common to the eight OPRM modules. They are INOP, TRIP ENABLE, ALARM, and BYPASS and are arranged in a reasonable group on the annunciator panel just to the right of the core map. The other four annunciators are TRIP alarms for each of the four channel pairs of modules and are each combined with the average power range monitor (APRM) TRIP/INOP alarms for that channel. They are arranged in a column just to the right of the above group.

Two key lock switches for each module are located on the local panels with the keys maintained in the control room and controlled per Operations Administrative Procedure.

The staff has reviewed Section 3, "Controls," and Section 7, "Annunciators," of the PNPP Human Factors Standards Desk Guide. Based on the licensee's statement that the annunciators and controls incorporate adequate human factors principles consistent with the guide, and the staff's examination of digital photographs of the new annunciators in the control room, the staff is satisfied that the changes have received adequate human factors review and have been implemented according to acceptable human factors principles. In addition, it was confirmed during discussions with the licensee that all instrumentation used in the manual mode has other functions and need not be removed from the control room. Therefore, the staff concludes that the changes to the plant operator's main control panel have received adequate human factors reviews per plant-specific procedures.

3.2 Revised TS 3.4.1, "Recirculation Loops Operating"

Due to the automatic functions provided by the OPRMs, the manual operator actions specified in TS LCO 3.4.1.a (and its associated Conditions, Actions and Surveillance Requirements) can be eliminated. Accordingly, the licensee has proposed to modify TS 3.4.1 by eliminating TS LCO items 3.4.1.a.2 and b.2, as well as SR 3.4.1.2, and replace ACTIONS C, D, E, and F with

the NUREG-1434 Standard Technical Specification (STS) ACTIONS A and B (as PNPP ACTIONS C and D). The staff finds these changes acceptable because the OPRMs will be providing automatic functions to replace the manual operator actions.

While the licensee's proposal models the STS, the following differences were identified:

(1) The existing PNPP TS 3.4.1 includes two License Conditions that are not contained in the STS. Condition A includes a two hour Required Action to correct a mismatch between recirculation loop jet pump flow while Condition B includes a one hour Required Action to reduce thermal power to ≤ 2500 MWt during single-loop operation. The staff notes that both of these License Conditions have previously been found to be acceptable and that they provide additional controls beyond the STS.

(2) The PNPP Required Action for Condition A is reworded to better reflect the appropriate action to be taken. Required Action A.1 will now say, "Declare the recirculation loop with the lower flow to be 'not in operation'."

The staff considers the justification for the revised Required Action A.1 (i.e., declare a loop "not in operation" if a mismatch develops that is greater than that assumed in the Loss of Coolant Accident (LOCA) analysis input assumption), versus the current requirement ('Shut down one of the recirculation loops') to be reasonable. Abnormal operating transient results for two-loop operation bound both thermal and overpressure consequences of one-loop operation at the reduced power level. Furthermore, the effect of the backflow due to shutdown of one of the recirculation loops, would result in less accurate flow input to APRM rod block and scram settings and would be less conservative, compared to resetting the APRM limits to their single-loop values for the proposed Required Action A1 in which there would be no expected backflow. Based on this information, the staff finds the proposed rewording acceptable.

(3) The time frame for implementing appropriate setpoints once the loop has been declared 'not in operation' is revised to be consistent with STS 3.4.1, Condition A (i.e., 24 hours). The staff finds this reasonable and acceptable.

3.3 TS 5.6.5, "Core Operating Limits Report (COLR)"

The licensee has proposed revising TS 5.6.5 to reflect implementation of the OPRM instrumentation. TS 5.6.5.a.5 will be introduced to indicate that core operating limits will be established for the OPRMs. In addition, TS 5.6.5.b.2 will be introduced to indicate that NEDO-32465-P-A "Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology for Reload Applications" is an acceptable methodology for determining core operating limits.

The staff has reviewed the proposed changes and finds them acceptable. It is appropriate to include the OPRM setpoints in the COLR and NEDO-32465 is an NRC-approved licensing Topical Report.

3.4 On-Site Review of Operability of OPRM Instrument

On November 29, 2000, the staff and its consultant from Oak Ridge National Laboratory performed an on-site review of the proposed OPRM instrumentation with respect to its testing data to support the implementation of the OPRM instrumentation within acceptable accuracy for its functional operability. The staff findings are described as follows:

Implementation Findings

1) The licensee has chosen to implement Stability Long Term Solution III, which is a "detect and suppress" option. Solution III is a modification to the reactor protection system, which shuts down the reactor if a power oscillation is detected. This solution was reviewed and approved by the staff.

2) Solution III requires the combination of LPRM signals in a series of OPRM (oscillation power range monitor) channels, which are similar in nature to the existing APRM channels, but differ only on the LPRM grouping. APRM channels average LPRM signals throughout the core. OPRM channels average LPRM signals from specific regions in the core, so that they can detect regional or out-of-phase oscillations. APRM channels are not sensitive to out-of-phase oscillations because they average them out. The LPRM groupings in the OPRM channels are designed to avoid this problem.

3) Solution III can be implemented using two hardware configurations: the so-called "ABB" or "GE" systems. The licensee has chosen to implement the "ABB" system, which consists of a single card per OPRM channel. The "ABB" hardware was reviewed and approved by the staff. The PNPP protection system requires a total of eight OPRM cards, which reside in the four APRM cabinets. The OPRM cards are hardwired to the LPRM signals.

4) The licensing topical report specifies procedures to evaluate the OPRM setpoints. These procedures require a number of calculations to ensure that the OPRM provides protection against safety limits even under out-of-phase oscillations. The licensee has performed these calculations and shown that their OPRM implementation provides this protection.

5) The implementation at PNPP appears to be complete and adequate to satisfy the elements of a long term solution. When the OPRM is armed in Cycle 9, the licensee will have implemented a long term stability solution in accordance with the actions requested in GL 94-02.

6) The OPRM installation will not cause a change to the existing analog APRM design or trip philosophy.

7) The APRM protective function is not affected by a worst-case OPRM failure.

8) The existing Neutron Monitoring System LPRM and APRM circuits have been analyzed to show there is no adverse impact due to the additional electrical load from the OPRMs.

9) The existing Reactor Recirculation Drive Flow cards have been analyzed to show there is no adverse impact due to the additional load from the OPRMs.

10) Online testing of the LPRMs will not require bypassing of the OPRMS.

11) The OPRM system addition does not impact the existing power feed to the Neutron Monitoring System, and the new power supplies are capable of handling the existing electrical load and the added OPRM load.

12) The new bulk power supplies conform to the standards of IEEE-344 and Regulatory Guides 1.29, 1.89, and 1.100.

13) Four of the OPRM modules use the same divisional power supply as the APRM with which they are associated. The remaining OPRM module in each channel uses the same divisional power supply as the SRM/IRM in the same channel. Consequently, electrical faults affecting an OPRM would only affect the same division and the overall conclusion of the single failure analyses provided in CENPD-400-P-A remain valid.

14) The interface between the OPRM and the non-1E annunciator equipment is through qualified optical isolation in accordance with IEEE 323-1974 and 344-1975.

15) The wiring for the non-1E portions of the equipment is maintained separate from 1E wiring within the panels.

Test Program Findings

1) The OPRM cards were installed and tested according to plant procedures, and the safety features of the cards are tested periodically using the built-in testing capabilities of the cards and the application-specific roll-away test computer that can generate test signals for the cards.

2) The initial installation included "ringing" the cables to guarantee that the proper LPRM signals were connected to the proper OPRM channels.

3) As specified by the topical reports, the licensee has installed the OPRM hardware and tested it for a full cycle. The OPRM cards have been installed since May 99. Testing included a mid-cycle outage and low-flow conditions inside the "Increased Awareness Region." Significant amounts of data have been collected and evaluated during this testing phase.

4) A variety of OPRM setpoints were tested. For the first part of the cycle, the licensee used the "A" settings, which proved to be too sensitive, giving a large number of false alarms. Later, (May 2000) they installed the "B" settings, which included different settings for each OPRM channel to determine which one was optimal.

5) The licensee has decided to use the least sensitive settings allowed under the topical report to avoid false positives, but has not implemented these final setpoints.

6) Testing requirements for the OPRM channels are similar to other protection system channels, and are covered by similar procedures. The main difference between OPRM and APRM scram testing is that the so-called "ultimate OPRM test" cannot be performed easily. To test a high-APRM scram, the operators inject a high DC value into the APRM output. To test the OPRM scram, the operator would need to inject a growing oscillation into 4 to 8 LPRMs, which the plant is not designed to do; thus, the OPRM is tested by injecting the test signal at the output of the OPRM, so that the scram algorithm and its hardware is tested. The staff believes that this testing is sufficient, because the LPRM to OPRM groupings were tested during the installation and are not likely to change.

7) The staff was shown the operation of the application-specific roll-away test computer, which is used to test the operability of the OPRM scram function, and is also used to collect OPRM time traces for analysis. This appears to be a good testing system which satisfies all the OPRM testing needs.

8) The staff was shown a large number of OPRM time traces that had been collected for 18 months since installation. Some of these traces corresponded to events with large periodic-based detection system "confirmation counts" with no apparent stability-related reason. These events had been analyzed by the plant personnel and indeed showed no problem. These events were the reason why the least-sensitive settings were preferred by the licensee for final implementation.

9) Some of the OPRM time traces corresponded to operational transients (e.g. pump up-shift during start up). These traces showed that these transients should not cause false OPRM alarms.

10) Overall, the staff judged the testing program of the OPRM implementation at PNPP to have been complete and successful.

Staff Observations

1) Overall control-room-testing procedures must be reviewed by the licensee to accommodate the requirements of the OPRM cards. For example, when the NRC team visited the control room, one of the OPRM cards showed the "trouble" indicator lit. It appears that the "trouble" indicator had been latched in the lit position some time earlier (maybe even weeks earlier) when the operators had been adjusting the LPRM gains without bypassing the OPRM channel. Adherence to this procedure will become important when the OPRM is activated and its output is connected to the scram relays. Experience at other plants has shown that half scrams can be produced by the OPRM channel when LPRM gains were being adjusted.

2) The issue of spares was raised by the staff during the review. The licensee has only one spare OPRM card, which is also used for the testing system. With life extension likely, the issue of obsolescence and lack of spare parts will have to be addressed in the future. The licensee stated that they will address the issue when, and if, a failure occurs. This is a generic problem of all instrumentation and control (I&C) equipment in power plants and not specific to the OPRM installation.

3.5 Staff Conclusion

The staff concludes that the proposed TS changes involving the implementation of the BWROG long-term stability solution Option III, using ABB/CE OPRM instrumentation for PNPP are acceptable because the proposed TS changes are in accordance with approved methodology.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Ohio State official was notified of the proposed issuance of the amendment. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

This amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 or changes a surveillance requirement. The staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluent that may be released offsite and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that this amendment involves no significant hazards consideration and there has been no public comment on such finding (65 FR 34745). Accordingly, this amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of this amendment.

6.0 CONCLUSION

The staff has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public.

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